

Serial No. 09/702,889

Docket No.: 122.1422

IN THE CLAIMS:

The text of all pending claims, (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~strikethrough~~. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered).

Please CANCEL claims 1 and 9 and AMEND claims 1, 11 and 10 in accordance with the following:

1. (CURRENTLY AMENDED) A plasma display apparatus, comprising:
a plasma display panel equipped with first electrodes and second electrodes arranged adjacently to each other, extending in a first direction, and address electrodes extending in a second direction at a right angle to the first direction;
an X sustaining circuit that supplies sustaining pulses to said first electrodes;
a Y sustaining circuit that supplies sustaining pulses to said second electrodes;
~~wherein~~ said X and Y sustaining circuits, further, respectively comprise
a first output device provided between a path connected to said first or second electrodes and a high potential power supply;
a second output device provided between the path connected to said first or second electrodes and a low potential power supply;
a first phase adjusting circuit that adjusts timing of a changing edge of a driving signal which drives said first output device, ~~and~~;
a second phase adjusting circuit that adjusts timing of a changing edge of a driving signal which drives said second output device; and
the adjustment by said first phase adjusting circuit being independent of the adjustment by said second phase adjusting circuit.
2. (PREVIOUSLY PRESENTED) The plasma display apparatus, as set forth in claim 1, wherein the X sustaining circuit and the Y sustaining circuit include power recovery circuits each of which has a resonant circuit formed with a display capacitor of the plasma display panel, recovers energy when an application of the sustaining pulse is released and uses the recovered energy for a next application of the sustaining pulses, is provided.
3. (PREVIOUSLY PRESENTED) The plasma display apparatus, as set forth in claim 2, wherein the X sustaining circuit and the Y sustaining circuit comprise the first and the second output devices connected between a path through which the sustaining pulses are supplied and

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a high voltage power source line, and between the path and a low voltage power source line, respectively, a third output device that switches a connection state of the path and the power recovery circuit to a state in which power is supplied from the power recovery circuit to the path, a fourth output device that switches the connection state of the path and the said power recovery circuit to a state in which power is recovered from the path to the power recovery circuit, and a first drive circuit through a fourth drive circuit that drive the first through the fourth output devices, respectively; and a phase adjusting circuit to adjust a time difference between a turning on of the third output device and that of the first output device, and a time difference between a turning on of the fourth output device and that of the second output device.

4. (PREVIOUSLY PRESENTED) The plasma display apparatus, as set forth in claim 3, wherein the phase adjusting circuit comprises the first phase adjusting circuit, the second phase adjusting circuit, a third phase adjusting circuit and a fourth phase adjusting circuit provided at a stage preceding the first drive circuit through the fourth drive circuit, respectively.

5. (PREVIOUSLY PRESENTED) The plasma display apparatus, as set forth in claim 1, wherein the plasma display panel forms a first display line between one side of one of the second electrodes and one adjacent electrode of the first electrodes, a second display line between another side of the one second electrode and another adjacent electrode of the first electrodes, and forms a display field of a frame by plural subfields, and provides a gray scale by combining said subfields selectively for display; the X sustaining circuit is equipped with a first X sustaining circuit that supplies the sustaining pulse to an odd-numbered electrode of the first electrodes, and a second X sustaining circuit that supplies the sustaining pulse to an even-numbered electrode of the first electrodes; and the Y sustaining circuit is equipped with a first Y sustaining circuit that supplies the sustaining pulse to an odd-numbered electrode of the second electrodes, and a second Y sustaining circuit that supplies the sustaining pulse to an even-numbered electrode of the second electrodes.

6. (PREVIOUSLY PRESENTED) The plasma display apparatus, as set forth in claim 5, wherein the first X sustaining circuit and the second X sustaining circuit and the first Y sustaining circuit and the second Y sustaining circuit are equipped with phase adjusting circuits, respectively; and a difference in rising or falling timing between the sustaining pulse output by the first X sustaining circuit and that output by the first or the second Y sustaining circuit, and a difference in rising or falling timing between the sustaining pulse output by the second X sustaining circuit and that output by the first or the second Y sustaining circuit are adjusted so that the differences of the timings are within a predetermined range.

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7. (PREVIOUSLY PRESENTED) The plasma display apparatus, as set forth in claim 6, wherein the predetermined range is within ± 30 ns.

8. (PREVIOUSLY PRESENTED) The plasma display apparatus, as set forth in claim 1, wherein a phase adjusting circuit is set by observing a waveform when the sustaining pulse is applied to the first or second electrode of the plasma display panel.

9. (CANCELLED)

10. (CURRENTLY AMENDED) A manufacturing method of a plasma display apparatus, ~~as set forth in claim 9, wherein~~ comprising a plasma display panel having first electrodes and second electrodes arranged adjacently to each other, extending in a first direction, and address electrodes extending in a second direction at a right angle to the first direction, an X sustaining circuit that supplies a sustaining pulse to said first electrodes, and a Y sustaining circuit that supplies a sustaining pulse to said second electrodes, wherein
signal delay times of circuit devices which form the X sustaining circuit and the Y sustaining circuit are measured and the circuit devices are classified according to the respective signal delay times;

sets of the classified circuit devices are selected so that a timing of a changing edge of each said sustaining pulse falls within a predetermined allowance and the sets of selected circuit devices are provided for the plasma display apparatus;

said plasma display panel forms a first display line between one side of one of the second electrodes and one adjacent electrode of the first electrodes, forms a second display line between another side of the one second electrode and another adjacent electrode of the first electrodes, forms a display field of a frame by plural subfields, and provides a gray scale by combining said subfields selectively for display;

the X sustaining circuit is equipped with a first X sustaining circuit that supplies the sustaining pulse to an odd-numbered electrode of the first electrodes, and a second X sustaining circuit that supplies the sustaining pulse to an even-numbered electrode of the first electrodes;

the Y sustaining circuit is equipped with a first Y sustaining circuit that supplies the sustaining pulse to an odd-numbered electrode of the second electrodes, and a second Y sustaining circuit that supplies the sustaining pulse to an even-numbered electrode of the second electrodes; and

a difference in rising or falling timing between the sustaining pulse output by the first X sustaining circuit and that output by the first or the second Y sustaining circuit, and a difference in rising or falling timing between the sustaining pulse output by the second X sustaining circuit

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and that output by the first or the second Y sustaining circuit are adjusted so that the differences of timings are within a predetermined range, when the circuit devices of the first and second X sustaining circuits and the first and second Y sustaining circuits are selected.

11. (CURRENTLY AMENDED) A plasma display apparatus having a plasma display panel with first electrodes and second electrodes arranged adjacently to each other, extending in a first direction, and address electrodes extending in a second direction at a right angle to the first direction, comprising:

X and Y sustaining circuits ~~to supply~~ supplying sustaining pulses to said first electrodes and said second electrodes, respectively, wherein said X and Y sustaining circuits respectively comprise:

- a first output device,
- a second output device,
- the first and second output devices of respective X and Y sustain circuits generating sustaining pulses,
- a first phase adjusting circuit ~~to adjust~~ adjusting timing of a changing edge of a first driving signal which drives said first output device, and
- a second phase adjusting circuit to adjust timing of a changing edge of a second driving signal which drives said second output device, and
the adjustment by said first phase adjusting circuit being independent of the adjustment by said second phase adjusting circuit.

12. (PREVIOUSLY PRESENTED) The plasma display apparatus, as set forth in claim 11, wherein the X sustaining circuit and the Y sustaining circuit, respectively, further comprising:
a power recovery circuit having a resonant circuit formed with a display capacitor of the plasma display panel to recover energy of an applied sustaining pulse for an application in a subsequent sustaining pulse.

13. (PREVIOUSLY PRESENTED) The plasma display apparatus, as set forth in claim 12, wherein the X sustaining circuit and the Y sustaining circuit, respectively, further comprise:
one of a first connection between a high voltage power source line and the first and the second output devices and a second connection between a low voltage power source line and the first and the second output devices to supply and recover energy from the sustaining pulses.

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14. (PREVIOUSLY PRESENTED) The plasma display apparatus, as set forth in claim 13, wherein the X sustaining circuit and the Y sustaining circuit, respectively, further comprise:

a first drive circuit through a fourth drive circuit that drive the first output device through the fourth output device, respectively; and a phase adjusting circuit to adjust a time difference between a beginning of an on-state of the third output device and a beginning of an on-state of the first output device, and a time difference between a beginning of an on-state of the fourth output device and a beginning of an on-state of the second output device.

15. (PREVIOUSLY PRESENTED) The plasma display apparatus, as set forth in claim 14, wherein the phase adjusting circuit comprises the first phase adjusting circuit, the second phase adjusting circuit, a third phase adjusting circuit and a fourth phase adjusting circuit provided at a stage preceding the first drive circuit through the fourth drive circuit, respectively.

16. (CANCELLED)

17. (PREVIOUSLY PRESENTED) The plasma display apparatus, as set forth in claim 1, wherein the first phase adjusting circuit phase-shifts the first driving signal which drives said first output device, and the second phase adjusting circuit phase-shifts the second driving signal which drives said second output device.

18. (PREVIOUSLY PRESENTED) The plasma display apparatus, as set forth in claim 17, wherein:

the first phase shifting circuit comprises:

a first output signal detecting circuit to detect an output of the first output device, and

a first phase difference detecting circuit determining the phase difference between the first driving signal and the output of the first output device to adjust the phase delay of the first phase adjusting circuit for a delay time of the first output device; and

the second phase shifting circuit comprises:

a second output signal detecting circuit to detect an output of the second output device,

and

a second phase difference detecting circuit determining the phase difference between the second driving signal and the output of the second output device to adjust the phase delay of the second phase adjusting circuit for a delay time of the second output device.

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19. (PREVIOUSLY PRESENTED) A plasma display apparatus, comprising:

- a plasma display panel equipped with first electrodes and second electrodes arranged adjacently to each other, extending in a first direction, and address electrodes extending in a second direction at a right angle to the first direction;
- an X sustaining circuit that supplies sustaining pulses to said first electrodes using a first drive signal;
- a Y sustaining circuit that supplies sustaining pulses to said second electrodes using a second driving signal, wherein said X and Y sustaining circuits respectively comprise:
 - a first phase adjusting circuit to adjust timing of a changing edge of a first driving signal, and outputting a first timing adjusted driving signal,
 - a second phase adjusting circuit to adjust timing of a changing edge of a second driving signal, and outputting a second timing adjusted driving signal,
 - a first output device turning on and turning off in response to the first timing adjusted driving signal, and provided between a path connected to said first electrode or said second electrode and a high potential power supply,
 - a second output device turning on and turning off in response to the second timing adjusted driving signal, and provided between the path connected to said first electrode or said second electrode and a low potential power supply, the first and second output devices producing and outputting the sustaining pulses by reciprocally and alternately turning on and turning off,
 - a power recovery circuit employing a capacitance of the plasma display panel to recover energy when a first application of the sustaining pulses occurs and to supply the recovered energy in a next application of the sustaining pulses,
 - a third output device to switch a connection state of the power recovery circuit to a state in which power is supplied from the power recovery circuit to the capacitance of the plasma display panel; and
 - a fourth output device to switch a connection state of the power recovery circuit to a state in which the power is recovered from the capacitance of the plasma display panel to the power recovery circuit, and
- wherein the first and second phase adjusting circuits adjust the timing of the changing edges of the first and second driving signals to prevent a time difference between turning on of the third output device of said respective X or Y sustaining circuit and turning on of the first output device thereof, and a time difference between a turning on of the fourth output device of said respective X or Y sustaining circuit and turning on of the second output device thereof.